

REMARKS

Claims 1-20 are pending herein. Claims 19 is added to recite a specific relationship between a data formatting unit, a clock circuit, a spread spectrum clock generator, and an array of light emitting diodes. Claim 20 is added to recite a specific function between a data formatting unit, a clock circuit, and an array of light emitting diodes.

No new matter is added by this Amendment. In view of the foregoing amendments and the following remarks, reconsideration of this Application is respectfully requested.

Applicant appreciates the courtesies shown to Applicant's representatives by Examiner Pham in the January 15, 2004 interview. Applicant's separate record of the substance of the interview is incorporated into the following remarks.

I. Information Disclosure Statement

Applicant respectfully requests acknowledgment of the Information Disclosure Statement submitted by the Applicant on August 13, 2003. As a courtesy, attached hereto is an additional copy of the Form PTO-1449 submitted with the Information Disclosure Statement. Return of an initialed and signed copy of this form is respectfully requested.

II. Rejections Under 35 U.S.C. §103(a)

A. Claims 1-18

Claims 1-5, 7-13, 15-16, and 18 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over U.S. Patent No. 6,525,842 B1 to Nakajima et al. (hereinafter referred to as "Nakajima") in view of U.S. Patent No. 6,476,845 B2 to Luman (hereinafter referred to as "Luman") and U.S. Patent No. 5,631,920 to Hardin (hereinafter referred to as "Hardin"). This rejection is respectfully traversed.

Nakajima describes an image processing apparatus for outputting image data that has been processed synchronously with a frequency modulated clock signal without the

associated printer pixel problems inherent with frequency modulation. According to Nakajima, if image data is processed by using a timing signal generated in accordance with a frequency modulating clock signal, there occurs a problem when the processed image data is output on a recording apparatus such as a printer in that the size of each dot is different. (Col. 1, lines 41-45). Thus, Nakajima attempts to modulate the frequency of the clock signal without the problem of changing dot size by processing output image data synchronously with the frequency modulation of the clock signal.

In addition, Nakajima attempts to allow an operator to confirm the operational state of the frequency modulation function. Specifically, the image processing apparatus includes a quartz oscillator 1201, a frequency modulation unit 1202, and a frequency modulation stop detection unit 1108 as shown in Figure 12. The frequency modulation stop detection unit 1108 compares both outputs of the quartz oscillator 1201 and the frequency modulation unit 1202 and supplies an output signal in conformity with the comparison result. If the output of the frequency modulation stop detection unit 1108 is equal to or lower than a V-ref, the frequency modulation stop detection unit 1108 supplies a CPU 1101 with a modulation stop detection signal. Upon reception of the modulation stop detection signal, CPU 1101 operates to display an alarm and turn off the power of the image processing apparatus. (Col. 13, lines 24-38).

As shown in Figure 12, the quartz oscillator 1201, the frequency modulation unit 1202, and the frequency modulation stop detection unit 1108 are coupled to an image processing unit 1111 of the image processing apparatus. The image processing unit 1111 includes a plurality of processing circuits as shown in Figure 12 and described in detail in Col. 11, line 12 through Col. 12, line 6. This series of image processing circuits described in

Nakajima performs image processing steps synchronously with the frequency modulated clock signal. (Col. 12, lines 6-8).

As evident from the foregoing, Nakajima is concerned with performing complicated image processing steps synchronously with the frequency modulated clock signal in order to adjust dot size. For example, the image data signal input to the image processing unit 1111 is subjected to pixel variation correction at the shading correction circuit 1203. (Col. 11, lines 46-48). Such synchronous processing steps are in contrast to the present invention which is directed to reducing electromagnetic interference (EMI) generated as a result of the use of arrays of light emitting diodes in an image formation process. Light emitting diode arrays do not require a series of image processing steps nor a plurality of image processing circuits. Nowhere does Nakajima describe or suggest that a spread spectrum clock generator could be used with a control unit along with an array of light emitting diodes in a light emitting diode bar system in order to acceptably reduce the electromagnetic interference emissions from the light emitting diode array.

Nakajima, in fact, directs one away from the present invention. Nakajima teaches that in order to be able to utilize a frequency-modulated clock signal, extensive image processing operations must be conducted as well. Such would direct one away from the use of frequency-modulated clock signals in view of these complicated image processing operations said to be required in Nakajima.

Nakajima does not teach or suggest either (1) that a spread spectrum clock generator can be used in association with an array of light emitting diodes in order to reduce the electromagnetic interference emissions from such array, or (2) how to implement a spread spectrum clock generator in a light emitting diode bar system for forming an image in order to

affect the reduction of electromagnetic interference emissions from the array of light emitting diodes of the light emitting diode bar system.

That is, with particular respect to the claim language of claim 1, Nakajima does not teach or suggest a light emitting diode bar system that includes a control unit having a clock circuit that outputs a clock output signal that enables properly timed activation of individual light emitting diodes of an array of light emitting diodes, which control unit further includes or is coupled to a spread spectrum clock generator that generates the clock output signal so that the clock output signal has reduced amplitude electromagnetic interference spectral components such that electromagnetic interference emissions from the array of light emitting diodes are reduced. With respect to claim 8, Nakajima similarly fails to teach or suggest a light emitting diode bar system that includes a spread spectrum clock generator that is coupled to an array of light emitting diodes and in which the spread spectrum clock generator generates a spread spectrum output signal and reduced amplitude electromagnetic interference spectral components such that electromagnetic interference emissions from the array of light emitting diodes are reduced.

As evident from the foregoing, Nakajima does not teach or suggest the light emitting diode bar systems of claims 1 or 8, or the method of reducing electromagnetic interference emissions from a light emitting diode bar system of claim 15, that has the recited construction and achieves the recited results. Nakajima does not teach the use of light emitting diodes at all, and thus would not have suggested the construction and interaction of components as recited in the present claims.

New claims 19 and 20 also present limitations not described or suggested by Nakajima. Nakajima describes that the image processing unit 1111 receives an input from the frequency modulation unit 1202 as an image data signal which is synchronized with the

frequency modulated clock signal. Nakajima does not describe or suggest a data formatting unit and a clock circuit coupled to an array of light emitting diodes, and a spread spectrum clock generator coupled to the data formatting unit and the clock circuit, wherein the spread spectrum clock generator generates a clock output signal having reduced amplitude electromagnetic interference spectral components such that electromagnetic interference emissions from the array of light emitting diodes are reduced as recited in claim 19. Further Nakajima does not describe or suggest a data formatting unit and a clock circuit coupled to an array of light emitting diodes, wherein the data formatting unit and the clock circuit output a clock output signal that enables properly timed activation of individual light emitting diodes of the array of light emitting diodes as recited in claim 20.

The Patent Office acknowledged that Nakajima failed to teach or suggest the laser printer having an array of light emitting diodes, but nevertheless concluded that one of ordinary skill in the art would have found such use obvious from the teachings of Luman. In particular, Luman was relied upon as allegedly suggesting that either a laser printer or a LED printer may be used in the formation of an image on a photosensitive drum. Applicant respectfully submits that Luman fails to remedy the deficiencies of Nakajima as discussed above.

Luman at best teaches only that light emitting diode arrays were known to be used in printers. Luman teaches that in general a laser printer system or a LED printer system may be used. Luman does not teach or suggest that the components for operating the different systems may be used in the other, i.e., nothing teaches or suggest the equivalence of the components of the different systems. Firstly, it would not have been obvious to one of ordinary skill to use the laser printer operating system of Nakajima in an LED printer system based only on a statement of alternative use of overall systems in Luman. Secondly, Luman

does not teach or suggest that the use of light emitting diodes, unlike the use of laser beams, have an increased problem with respect to electromagnetic interference emissions. Luman also fails to teach or suggest how to control electromagnetic interference emissions from light emitting diodes if used. Finally, like Nakajima as discussed above, Luman fails to teach or suggest how to implement the use of a spread spectrum clock generator in conjunction with a light emitting diode bar system that includes an array of light emitting diodes for forming an image.

The mere known use of light emitting diodes in printers as indicated in Luman would not have led one of ordinary skill in the art to the presently claimed invention in which, for the first time in the art, a practical and simple solution to the problem of electromagnetic interference emissions from light emitting diodes of a light emitting diode bar system is achieved.

Finally, with respect to claims 2-5 and 10-13, Hardin was relied on with respect to features of a frequency modulation unit. It must be emphasized that neither Nakajima nor Hardin teach or suggest use of a light emitting diode bar system as recited in claims 1 and 8 to reduce the electromagnetic interference emissions from the array of light emitting diodes.

For all the foregoing reasons, Applicant respectfully submits that none of Nakajima, Luman, or Hardin would have led one of ordinary skill in the art to the presently claimed invention and the reduction in electromagnetic interference emissions from an array of light emitting diodes as presently claimed. Reconsideration and withdrawal of this rejection are thus respectfully requested.

B. Claims 6, 14, and 17

Claims 6, 14 and 17 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Nakajima in view of Luman and Hardin, and further in view of U.S. Patent

No. 6,240,123 B1 to Zhang et al. (hereinafter referred to as "Zhang"). This rejection is respectfully traversed.

The Patent Office turned to the teachings of Zhang as allegedly suggesting an asynchronous spread spectrum modulation technique for generating a spread spectrum clock signal, and concluded that one of ordinary skill in the art would have found use of such technique obvious in the device of Nakajima.

Applicant respectfully submits that even if the teachings of Zhang were to have been combined with the teachings of Nakajima, Luman, and Hardin as alleged in the Office Action, the presently claimed invention still would not have been achieved. Zhang remedies none of the deficiencies of Nakajima, Luman and Hardin discussed extensively above. That is, Zhang also fails to teach or suggest how to implement a spread spectrum clock generator within a light emitting diode bar system so that electromagnetic interference emissions from the light emitting diodes of the bar system are acceptably reduced.

For the foregoing reasons, Applicant respectfully submits that none of Nakajima, Luman, Hardin or Zhang teach or suggest the presently claimed invention. Reconsideration and withdrawal of this rejection are respectfully requested.

III. Conclusion

In view of the foregoing amendments and remarks, Applicant respectfully submits that claims 1-20 are in condition for allowance. Should the Examiner believe that anything further is necessary in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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Attachment:
Form PTO-1449

Date: January 20, 2004

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